ABISKO
NATURVETENSKAPLIGA
STATION
KUNGL. VETENSKAPSAKADEMIEN
ABISKO SCIENTIFIC RESEARCH STATION
THE ROYAL SWEDISH ACADEMY OF SCIENCES

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PERSONAL *STAFF* 1988-01-01--

Föreståndare, Professor *Director*	Mats Sonesson, FD *PhD*
Docent, Meteorolog *Assistant Professor, Meteorologist*	Björn Holmgren, FD *PhD*
Docent *Assistant Professor*	Staffan Karlsson, FD *PhD*
Intendent *Assistant Director, Superintendent*	Nils Åke Andersson, FM *BSc*
Tekniker *Technician, Meteorological Observer*	Anders Eriksson
Institutionsbiträde *Matron*	Frid Fjärdbo
Laboratorieassistent *Laboratory Technician*	Svante Inemyr
Laboratorieassistent *Laboratory Technician*	Sune Larsson
Institutionssekreterare *Secretary*	Linnéa Patomella
Forskningsingenjör *Engineer*	Martin Tjus, Civ ing *M Eng*
Tekniker *Technician, Electrician*	Bengt Wanhatalo

Övriga knutna till stationens forskningsprogram:

T V Callaghan, ITE, England	*PhD*
B Carlsson, Växtekol inst, Lund	FK *BSc*
D W Goodall, CSIRO, Australien	Professor
J Hoogesteger, Helsinki, Finland	*BSc*
H Kauhanen, Turku, Finland	FM *BSc*
Ch. Körner, Innsbruck, Österrike	*PhD*
O Nordell, Växtekol inst, Lund	FK *BSc*
M Ovhed, Meteorol inst, Uppsala	FK *BSc*
B Sveinbjörnsson, Anchorage, U.S.A.	Professor
B Svensson, Växtekol inst, Lund	FD *PhD*

postadress, *address*
S-980 24 Abisko, Sweden
Tel. +46-(0)980-400 21

järnvägsstation, *railway station*
Abisko Östra

Abisko Scientific
Research Station

RESEARCH PROJECTS 1988

I. BIOLOGICAL PROJECTS

1. ECOLOGY OF THE TREE-LINE IN THE TORNETRÄSK AREA

Objective: To investigate the ecological background of the changes -recent as well as past changes during Late Quaternary times- in the altitudinal distribution of some arctic-alpine biota at the tree-line.

1.1 SOME BIOLOGICAL PROCESSES OF THE MOUNTAIN BIRCH AND THEIR RELATIONSHIPS WITH VARIOUS ENVIRONMENTAL FACTORS AT THE TREE-LINE

Objective: To elucidate the relationship between some biological processes of the mountain birch, Betula pubescens ssp tortuosa, and various environmental factors, in order to gain a better understanding of the factors and processes primarily responsible for the altitudinal distribution of the species.

Researcher: Dr. B. Sveinbjörnsson, University of Anchorage, U.S.A.

1.2 CARBON ECONOMY OF EVERGREEN AND DECIDUOUS DWARF SHRUBS IN RELATION TO THE ENVIRONMENT AND ITS IMPLICATION FOR THEIR ECOLOGICAL PERFORMANCE

Objective: To investigate some ecophysiological characteristics and their role in the ecological performance of evergreen and deciduous dwarf shrubs.

Researcher: Dr. S. Karlsson, Abisko Scientific Research Station

1.3 REPRODUCTION ECOLOGY OF THE MOUNTAIN BIRCH IN THE TORNETRÄSK AREA

Objective: To investigate and explain the reproduction (including establishment) of the mountain birch (Betula pubescens ssp tortuosa) in subarctic ecosystems in relation to some principal environmental factors.

Researcher: O. Nordell, Dept. of Plant Ecology, Lund

1.4 WATER RELATIONS OF THE MOUNTAIN BIRCH, ESPECIALLY THE RESPONSE TO WATER STRESS

Objective: To elucidate in quantitative terms, the significance of water stress for the altitudinal distribution of mountain birch (*Betula pubescens* ssp *tortuosa*) in subarctic mountains

Researcher: H. Kauhanen, University of Turku, Finland

1.5 ECOTYPIC DIFFERENTIATION OF LIFE-HISTORY CHARACTERS AND ADAPTATION IN CAREX BIGELOWII AGG.

Objective: To elucidate the significance of various biotic and abiotic pressures for the morphology, growth, population dynamics and reproduction of *Carex bigelowii* along an altitudinal gradient

Researcher: Dr. T.V. Callaghan, Institute of Terrestrial Ecology, Grange-over-Sands, Cumbria, U.K., and B. Carlsson, Dept. of Plant Ecology, Lund

1.6 NICHE DIFFERENTIATION IN SOME CRYPTOGAMS AT THE TREE-LINE IN THE TORNETRÄSK AREA

Objective: To elucidate the difference in the ecology of some arctic-alpine and boreal cryptogams above and below the tree-line

Researcher: Dr. M. Sonesson, Abisko Scientific Research Station

1.7 GROWTH OF BETULA PUBESCENS SSP TORTUOSA AND PINUS SYLVESTRIS SEEDLINGS IN RELATION TO CARBON AND NITROGEN ALLOCATION.

Objectiv: To relate differences in growth between these two species to their abilities to optimize the carbon allocation pattern and efficiency of nitrogen uptake and utilization under low nitrogen resource levels.

Researcher: O. Nordell, Dept. of Plant Ecology, Lund and Dr. S.Karlsson, Abisko Scientific Research Station

1.8 COMPARATIVE STUDIES OF CARBON AND NUTRIENT RELATIONS IN ARCTIC AND ALPINE PLANTS

OBJECTIVE: To test the following hypotheses:
a. Comparable plants from arctic and subarctic environments have longer life spans than plants from alpine environments
b. Comparable plants from arctic and subarctic environments produce "cheaper" leaves in terms of nitrogen per unit leaf area and show structural features related to lower photosynthetic capacity

Researchers: A joint research programme between the Department of Botany, University of Innsbruck, Austria (Dr. Ch. Körner) and Abisko Research Station (Drs. M. Sonesson and S. Karlsson)

2. OTHER WORK IN ECOPHYSIOLOGY AND POPULATION ECOLOGY

2.1 DYNAMICS OF GROWTH IN LYCOPODIUM ANNOTINUM (INTERRUPTED CLUB MOSSES) IN RELATION TO MAJOR ENVIRONMENTAL FACTORS

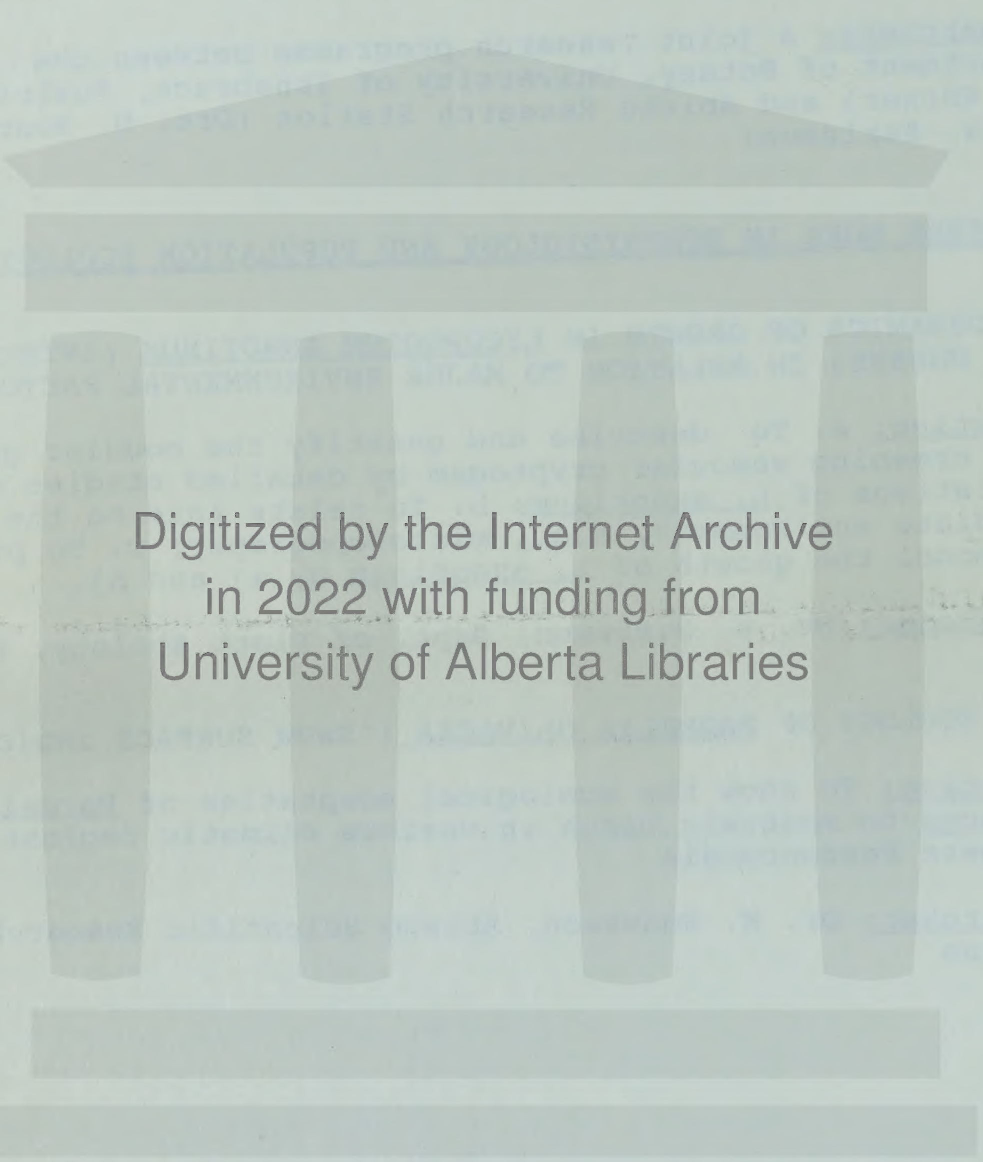
Objective: a. To describe and quantify the modular growth of a creeping vascular cryptogam by detailed studies of populations of *L. annotinum*; b. To relate this to the immediate environment, e.g., microtopography; c. To predict and model the growth of *L. annotinum* by a) and b).

Researcher: Dr. B. Svensson, Dept. of Plant Ecology, Lund

2.2. ECOLOGY OF PARMELIA OLIVACEA ("SNOW SURFACE INDICATOR")

Objective: To show the ecological adaptation of *Parmelia olivacea* to mountain birch in various climatic regions in northern Fennoscandia

Researcher: Dr. M. Sonesson, Abisko Scientific Research Station



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2.3 EFFECTS OF CARNIVOROUS HABIT ON THE NUTRIENT STATUS OF THE GENUS PINGUICULA AND ITS IMPLICATIONS FOR POPULATION DYNAMICS AND REPRODUCTION

Objective: To evaluate which nutrients are gained through the carnivorous habit and their significance in population dynamics and reproductive output for closely related species growing on contrasting substrates.

Researchers: B. Carlsson, Dept. of Plant Ecology, Lund, Dr, S. Karlsson, Abisko Scientific Research Station, O. Nordell and Dr. B. Svensson, Dept. of Plant Ecology, Lund.

II. METEOROLOGICAL PROJECTS

1. LOCAL CLIMATE IN THE TORNETRÄSK AREA

Objective: To study the relationship between local climate and wind circulation caused by the topography and by temperature differences between Lake Torneträsk and surrounding land surfaces

Researcher: Dr. B. Holmgren, Abisko Scientific Research Station

2. INTERACTION BETWEEN VEGETATION AND FROST HEAVING IN PATTERNED GROUND

Objective: To determine the ecological effects of frost heaving on plant distribution in the Abisko Valley.

Researchers: Dr. S. Jonasson, Dept. of Botany, Gothenburg and Dr. J. Åkerman, Dept. of Physical Geography, Lund, in collaboration with Dr. B. Holmgren, Abisko Scientific Research Station

3. COLD AIR ACCUMULATION AND OUTBREAKS OF EPIRRITA (OPORINIA) AUTUMNATA IN NORTHERN FENNOSCANDIA

Objective: To investigate the build-up and dynamics of cold-air domes and streams in order to test the hypothesis that cold air limits the outbreaks of Epirrita autumnata in mountain-birch forests.

Researchers: Dr. O. Tenow, Swedish University of Agricultural Sciences, in collaboration with Dr. B. Holmgren, Abisko Scientific Research Station.

4. THE MICROCLIMATE OF THE MOUNTAIN BIRCH FOREST, INCLUDING ITS ENERGY AND WATER VAPOUR EXCHANGE WITH THE ATMOSPHERE

Objective: To investigate the relationships between the components in the energy balance and their bioclimatic effect.

Researcher: M. Ovhed, dept. of Meteorology, Uppsala.

Abisko naturvetenskapliga station

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NORRSKEN (Aurora borealis) Abisko-mot nordost

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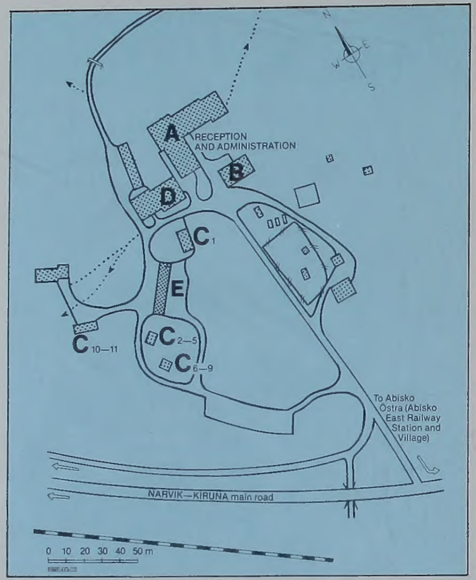
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RECEPTION AND ADMINISTRATION
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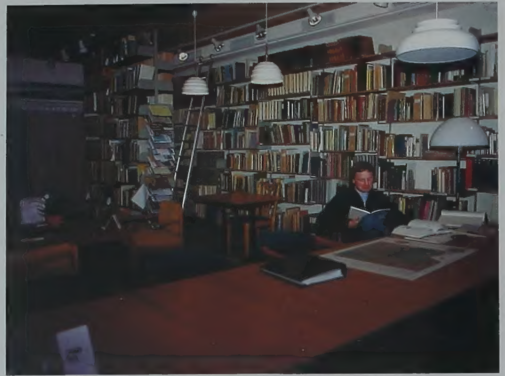
To Abisko Östra (Abisko East Railway Station and Village)
NARVIK—KIRUNA main road
0 10 20 30 40 50 m

usual work with metal, wood, plastic and paint and for the repair and maintenance of cars and other motor vehicles. There is a special workshop for electronic instruments (engineer's workshop, A).

Accommodation is available in 20 2-bed rooms (B and D) and in two family apartments. During the summer an additional 40 people can be accommodated in small chalets (C). A lounge, exercise room, guest lockers, drying rooms, saunas and fully equipped kitchens and dining-rooms for self-catering are also available (D, B, A). A larger kitchen and a dining-room for approximately 50 people are intended mainly for conferences and courses (A). The station can provide meals only under exceptional circumstances and then only for short periods. Meals are also obtainable during the tourist season at the tourist hotels and guest houses (within a 10—15 minute walk). At the meteorological observatory continuous records of meteorological variables have been made for more than 70 years. There are 5 small field research cabins in both subalpine and alpine environments within distances of 10—30 km from Abisko. A



boat operating on Lake Torneträsk can hold 12 people. It is equipped with an echo sounder. There is no charge for the lecture hall, workrooms and laboratories but there is a modest cost for the lodging. Reference material not available at the station library (A) can be ordered by the staff from the university libraries.

Application

Application for accommodation and working space should be submitted to the director. Include a brief plan of the precise nature of the research, the desired time schedule, personal particulars and a degree certificate. Application for the summer season must be submitted no later than 1 April to the address below.

Further information can be obtained on
1. current prices
2. available laboratory and field equipment
3. field research cabins
4. area description
5. practical advice for newcomers to the area

Abisko naturvetenskapliga station (Abisko Scientific Research Station)
S-980 24 Abisko
Telephone 0980-400 21 (office)
0980-400 39 (guests)

The Royal Swedish Academy of Sciences
is a non-governmental scientific organization. The purpose, stated in 1739, is "to promote the sciences, primarily mathematics and natural science". Today the Academy serves this purpose for example through activities at its six institutions (among them The Abisko Scientific Research Station), by stimulating national and international research co-operation, by issuing scientific journals and by distributing scientific information to the press and the general public.

The Academy has about 275 Swedish members, divided into twelve classes according to scientific affiliation. Altogether there are 134 foreign members. The Academy has a Secretariat consisting of some twenty employees headed by the Secretary General of the Academy.

The Academy awards scholarships and grants for research. Each autumn the Academy selects the Nobel Laureates in physics and chemistry and also recipients of the prize in Economic Sciences in Memory of Alfred Nobel. The recently established Crafoord prize is awarded to prominent scientists in mathematics and astronomy, geosciences, biosciences (especially ecology) and polyarthritis.

The Academy has bilateral agreements on exchange of scientists with Academies in ten other countries, and represents Sweden in the International Council of Scientific Unions (ICSU). The Academy also administers the Swedish national committees which represent the international scientific unions in Sweden.

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Box 50005
S-104 05 Stockholm
Sweden
Tel. 08-15 04 30

The Abisko Scientific
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Sweden
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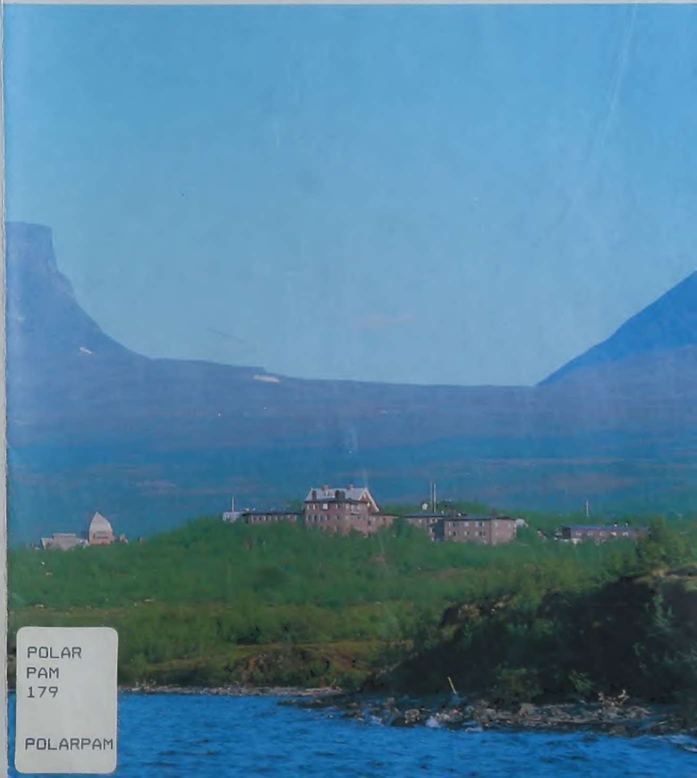
Bohusläningens Boktryckeri AB, Uddevalla 1985

ABISKO

SCIENTIFIC RESEARCH STATION

The Royal Swedish Academy of Sciences



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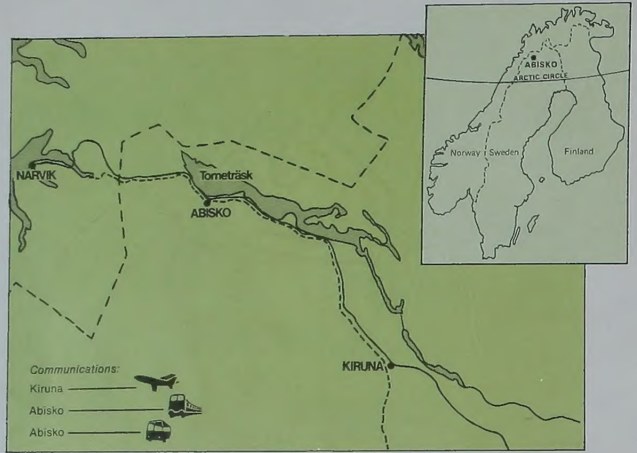


Location and Environment

The station is situated at Abisko (68° 21′ N, 18° 49′ E) about 200 km north of the arctic circle, and approximately 385 m above sea level on the south shore of Lake Torneträsk. The area has a particularly varied topography, geology and climate, as well as flora and fauna. The lake surface is at 341 m and the highest mountain in the area reaches 1991 m. The dominating physical feature is Lake Torneträsk with an area of about 330 km² (and a catchment area of 3 300 km²) and a mean depth of 52 m. The average annual temperature at low altitudes is approximately −1.0°C. July is the warmest month (mean about +11°C) and February the coldest (−12°C). Annual precipitation varies from about 1000 mm in the western part to 400 mm in the eastern, with a minimum of 300 mm (among the lowest in all Scandinavia) in the sheltered Abisko valley.

Approximately 60 percent of the catchment basin is below the treeline. Forests are composed mainly of mountain birch. The vegetation is extremely varied, ranging from the simple communities that follow retreating glaciers to more complex forest ecosystems.

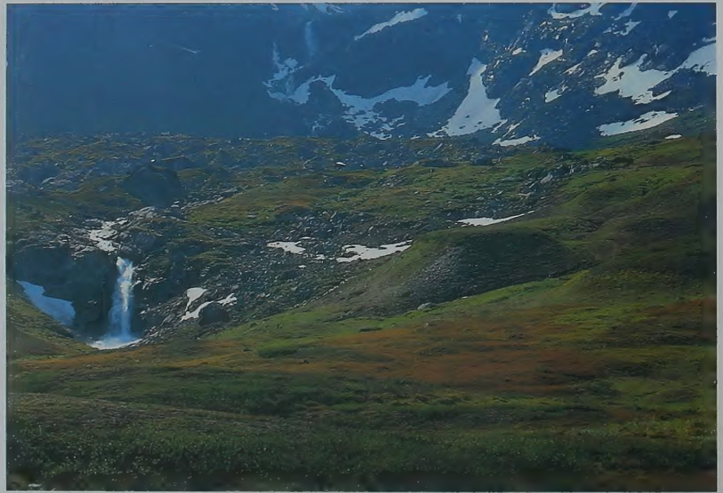
The station is situated in a 46-hectare nature reserve (established in 1982) close to the Abisko National Park, which is 75 km² (established in 1909).

Tourist seasons are in late winter, spring and summer. At other times the area is sparsely populated. Most buildings are near the railway and the highway.

Administration

Activities are supervised by a director and an elected board representing the biological and geoscientific disciplines, as well as nature conservancy and education.

The permanent staff is composed of scientific and technical personnel.



History and Purpose

The history of the Abisko Scientific Research Station dates back to 1903 when the first field station was established in the Torneträsk area. Since 1935 it has been under the auspices of The Royal Swedish Academy of Sciences.

The objective of the station is: ''to provide Swedish and foreign visiting scientists with the opportunity of conducting scientific work based on the specific conditions of the environment surrounding the station and also to conduct such research with its own personnel''. The station is also available for teaching and scientific meetings.

Research is carried out by visiting scientists, the station staff, and, in the case of large and/or long-term projects, by the station staff or researchers from various other institutions.

Investigations in many areas of the biosciences and geosciences are carried out at the station. Staff research emphasizes plant ecology and meteorology.

Facilities

The station is made up of new or recently renovated buildings (A, B, D, E) and is kept open throughout the year. The 22 workrooms and laboratories cover a total area of 750 m², including, for example, chemistry, radio- and geo-laboratories, microscopy, drawing and computer rooms, an integral greenhouse, a darkroom and a growth room (A, B). Cold rooms (−30; −5; +5°C) and rooms with balances, and drying ovens (for biological materials) are also available (A). Near the meteorological observatory there are two experimental gardens, measuring approximately 5 by 10 m and 10 by 10 m.

The laboratories contain general equipment, such as basic chemicals and instruments, as well as more specialized equipment, for example, for eco-physiological and meteorological research. Currently updated lists of equipment and material that can be used by visiting scientists, some free of charge, others only available after special agreement, will be sent on request.

The lecture hall (B) can accommodate approximately 50 people. In the same building there are a reference collection room and two laboratories intended mainly for teaching. The workshop (E) is equipped for all the

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